Name _____

STUDY GUIDE Chapter 2: Chemistry of Life

1. _____ have a positive charge, _____ have a negative charge, and _____ are neutral with no charge. _____ and _____ are found in the nucleus of an atom.

2. A neutral atom has the same number of _____ and _____. In an isotope, atoms of the same element differ in the number of _____. An element's atomic number identifies the number of _____ in its atoms.

3. A pure substance that consists entirely of one type of atom is called a/an _____. A pure substance formed by the chemical combination of 2 or more different elements in definite proportions is called a/an _____. Two or more elements or compounds that are physically mixed together but NOT chemically combined are called a/an _____.

4. Give an example of each of the following:

- Mixture _____
- Compound _____
- Element _____

5. In a covalent bond, electrons are _____ between atoms. In an ionic bond, electrons are _____ from one atom to another. _____ are positively or negatively charged atoms formed from the gain or loss of electrons.

6. Oxygen, carbon dioxide, and water are examples of _____ compounds because they do NOT contain _____ chains. Carbohydrates, lipids, proteins, and nucleic acids are examples of _____ compounds because they DO contain _____ chains.

7. Water is polar, with a negative pole near its _____ atom and a positive pole between its _____ atoms. Because of this polarity, it forms a weak attraction with the hydrogen atoms of other water molecules called _____ bonds, which are weaker than covalent or ionic bonds.

8. Which of the following is true regarding water/ice? (circle the correct choice in EACH row)

- At its freezing point, water **expands** OR **contracts**
- Compared to water, ice is **more dense** OR **less dense**
- In water, ice **floats** OR **sinks**
- This is important because the ice **kills most aquatic organisms** OR **insulates water below**

9. _____ is the attraction between molecules of different substances. _____ is the attraction between molecules of the same substance.

10. Define specific heat capacity.

11. Cohesion and adhesion are important to living things because these attractions help draw _____ out of plant _____ and into their _____.

12. Water is also special because it has a_____ specific heat capacity, which allows large bodies of water to absorb lots of _____ with only small changes in _____, thus moderating temperature and helping support life on Earth.

13. Carbon can form _____ covalent bonds. Monomers are joined to form polymers by _____, which forms bonds through the _____ of water. Polymers can be split back into monomers by _____, where bonds are broken through the _____ of water.

14. Label each of the following as an example of hydrolysis or dehydration synthesis:

- Glucose and fructose are joined to form sucrose _____
- Sucrose is split into glucose and fructose _____
- 3 fatty acids and a glycerol are joined to form a triglyceride _____
- Proteins are split up into separate amino acids _____

15. Name the monomers that make up each of the following polymers:

- Nucleic acids _____
- Proteins _____
- Carbohydrates _____
- Lipids _____

16. Glucose, fructose, and galactose are examples of _____. Sucrose is an example of a/an _____. Glycogen, plant starch, and cellulose are examples of _____.

17. Lipids are not _____ soluble. _____, waxes, and _____ store energy, pad and insulate the body, and form waterproof coverings. _____ make up cell membranes. _____ are hormones that act as chemical messengers.

18. _____ fats contain only single covalent bonds between carbon atoms and contribute to the development of _____. _____ fats contain one or more double covalent bonds between carbons and are the _____ types of fats in the diet.

19. Two examples of nucleic acids are _____ and _____. Nucleotides consist of a 5-carbon _____, a _____ group, and _____ bases.

20. Amino acids consist of a central carbon bonded to an _____ group, a _____ group, a _____ atom, and the _____ group. _____ bonds are a special type of covalent bonds that link amino acids together to form a polypeptide. Protein _____ is very important to its function.

21. Describe each level of protein structure:

- Primary structure
- Secondary structure
- Tertiary structure
- Quaternary structure

22. Explain at least one function of each of the following macromolecules.

- Carbohydrates
- Lipids
- Nucleic Acids
- Proteins

23. _____ enter chemical reactions and _____ are produced by chemical reactions. Energy is _____ or _____ when chemical bonds are broken or formed.

24. Enzymes are proteins that act as _____ by _____ chemical reactions in cells without being permanently changed. They do so by _____ the reaction's _____ energy. The shape of an enzyme is very important, because certain enzymes can only catalyze certain _____.

25. In a chemical reaction, what happens to the concentration of each of the following as the reaction progresses? (increases, decreases, or stays the same)

- Concentration of reactant/substrate _____
- Concentration of product _____
- Concentration of enzyme _____

26. Each enzyme has an optimal _____ and _____ at which it functions. Changing those conditions too much can _____ the protein, causing a change in the _____ of a protein by breaking hydrogen bonds, making the protein nonfunctional.

27. How would each of the following initially affect the rate of a typical chemical reaction? (speed up, slow down, or stay the same)

- Increasing enzyme concentration (if there are enough substrates) _____
- Increasing substrate concentration (if there are enough enzymes) _____
- Increasing enzyme concentration (if there are double compared to substrates) _____
- Increasing substrate concentration (if there are double compared to enzymes) _____
- Increasing the temperature gradually _____
- Increasing the temperature drastically _____
- Changing the pH outside the enzyme's optimal range _____

28. Use the graph below, which shows the total amount of product from a chemical reaction performed at three different temperatures, to answer the following questions.

Note: The same enzyme was involved in each case.

At which temperature was the greatest amount of product formed? _____

If a student performed the same chemical reaction at 30°C, approximately how much product can she expect to obtain? _____